T. DROPIOWSKI.

TYPE CASTING AND SETTING MACHINE.

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Fig. 1.

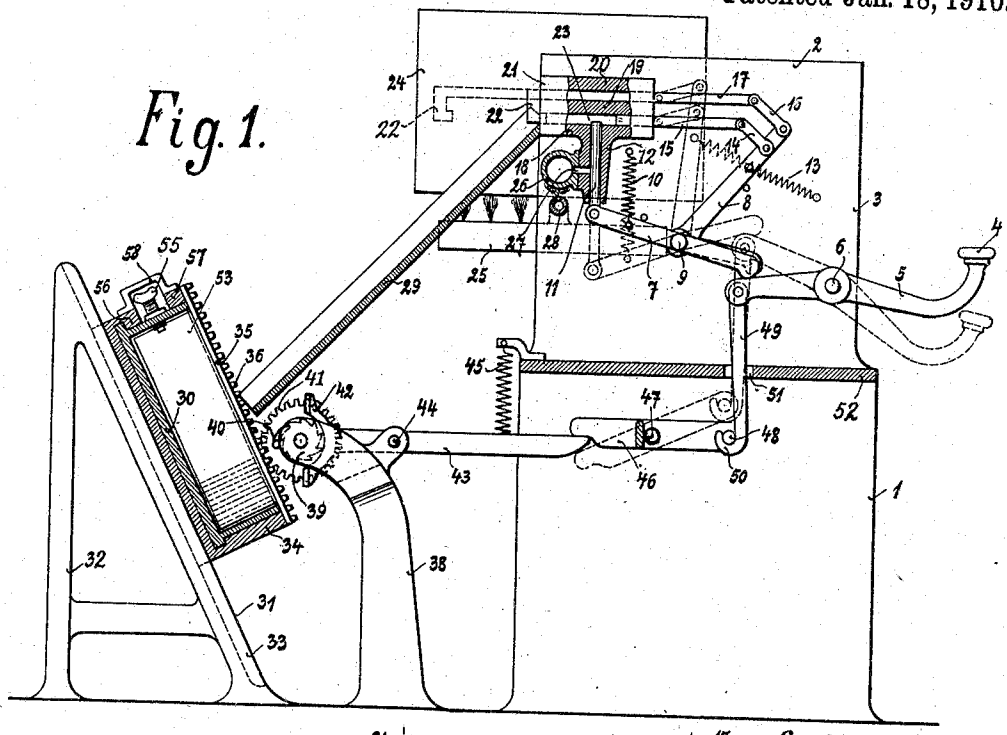
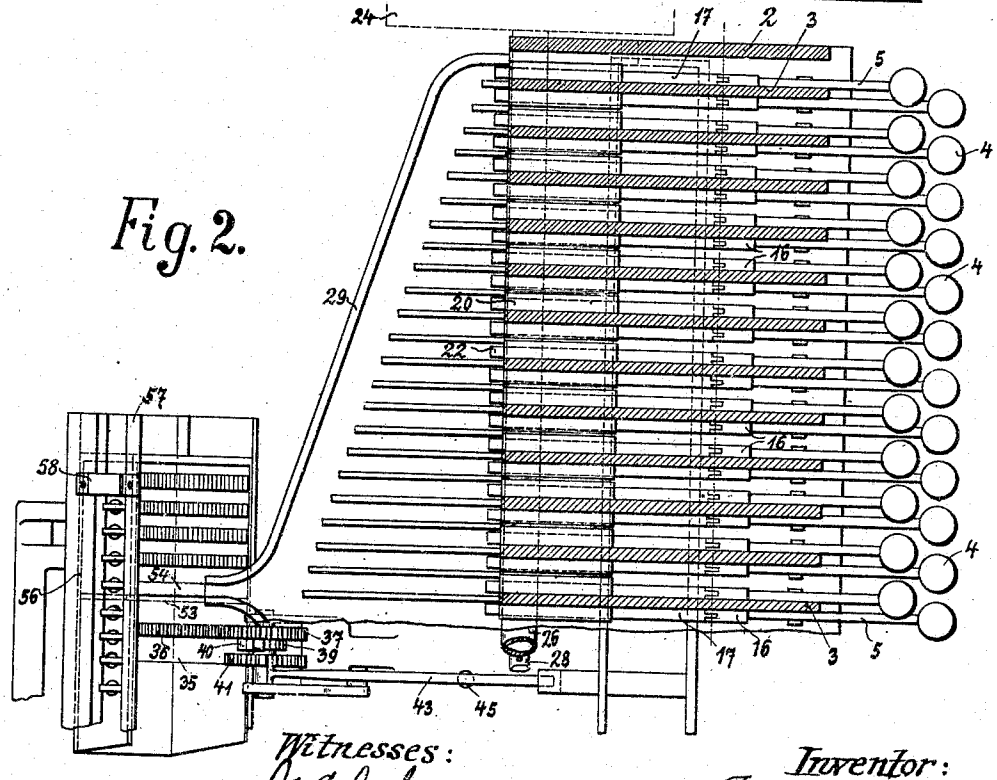


Fig. 2.



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TYPE CASTING AND SETTING MACHINE.

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To all whom it may concern:

Be it known that I, THADDÄUS DROPIOWSKI, a subject of the Emperor of Austria, and residing at Cracow, Galicia, Empire of Austria-Hungary, have invented certain new and useful Improvements in Type Casting and Setting Machines, of which the following is a specification.

My invention relates to those type casting and setting machines, in which for each character there is a special mold in which the types are made as they are required, liquid type metal being forced by a pump into each empty mold after the ejection of a type. Apart from the fact that the well-known machines are relatively heavy to operate, they have, besides other disadvantages, the objection that they not only are very complicated but require motors for driving them, and the consumption of energy is very great in proportion to the actual useful work accomplished, this being due to the reciprocation of large masses not only while useful work is being done, but also while the machine is running idle.

Now a primary object of my invention is to provide an improved type casting and setting machine superior to all well-known machines and those of the special kind first mentioned above, in which improved machine both the types are cast and also set without special motor power, the machine being readily portable in consequence. With this purpose in view I provide that all the functions of the machine, both those connected with casting and ejecting the types and those connected with setting them, are occasioned solely by pressure on keys, which presupposes a construction of machine in which the consumption of energy is reduced to a minimum.

According to my invention I provide a special mold, immovable in itself, for each character, and close it in such manner by two movable, pusher-like bodies, the mold punch and the closure punch, that the mold punch having a matrix is sent by pressure on a key into the mold and ejects the type located there, whereas the closure punch simultaneously liberates the front aperture of the mold. Simultaneously as a type is ejected, the pump piston is lowered by the same pressure on the key, and the cylinder of the pump is filled with a corresponding quantity of the type metal which remains in the cylinder until after the pressure on the key has ceased, when the two punches return into their normal position and open the cylinder, so that the type metal is now forced by the returning piston into the mold which is now empty, and a new type is produced which can be subsequently ejected corresponding to the requirement by a renewed motion of the appertaining key and punch. The collector or letter case in which the ejected types arrive is also moved, however, by the same pressure on the key. In order that this may also take place without the machine being driven by a motor, the collector is mounted in a manner known in itself on vertical or slanting faces so that it can descend under its own weight, which is effected according to the number of superposed types by pressure on a key with the intermediary of suitable pawl and ratchet mechanism.

Additional features of my invention are explained hereinafter, and in order that my invention may be clearly understood I will now explain the same with reference to the accompanying drawing in which one constructional form is represented by way of example.

In said drawing: Figure 1 is a vertical longitudinal section through my improved machine, and Fig. 2 is a top plan view of the same, the cover having been removed, and parts being shown broken away.

Referring to the drawing, supports 1 carry a frame 2 having a number of partitions 3, by which the space inclosed by the frame is subdivided into a number of narrow chambers in which the various devices for manufacturing types and ejecting them, that is to say for casting types and setting them, are located, like devices being arranged on each side of the partitions 3 so that each partition carries two such identical devices. The construction of these devices for casting and setting is clearly shown in Fig. 1. The key 4, from the top side of which its character or letter can be known as in the key of a typewriter, is on one arm of a two-armed lever 5 revoluble around the pivot 6. The other arm of this lever acts on a simple two-armed lever 7 and on a bent lever 8 which both rock around the same fulcrum 9. The lever 7 is under the action of a spring 10 and connected revolubly at one

end with a piston 11 which can reciprocate vertically in a cylinder 12. The bent lever 8, on the contrary, which is under the action of a spring 13, is connected on the one hand by a link 14 with the mold punch 15 and by a link 16 with a punch 17. These two punches move between the plates 18 and 19 and 19 and 20, respectively, which are covered laterally by a plate 21. Between the plates 18, 19 and 20 there are corresponding gaps or slots; the punch 17 goes entirely through the slot between the plates 19 and 20 and its U-shaped end 22 extends somewhat into the lower slot between the plates 18 and 19 as clearly shown. The mold punch 15 is only so long that there remains between the U-shaped end of the punch 17 and itself a space bounded in addition by the plates 18 and 19 and forming the type mold 23. The front end of the punch 15 has a letter or character incised or impressed in it, so that when liquid type metal is introduced into the mold 23 it fills the mold and obtains simultaneously the character given it by the punch 15.

Laterally of the machine frame 2 is located a boiler 24 containing liquid type metal which is melted or kept molten by a suitable burner 25. From this boiler 24, which is supported in suitable manner, a pipe 26 goes the entire breadth of the machine and is connected by lateral ducts 27 with the different cylinders 12. Preferably a pipe 28 is connected with the burner 25, through which pipe, gas, for example, is supplied, so that the pipe 26, which always contains liquid metal, can be heated.

With regard to the mode of operating the machine it will first be supposed that a type is in the mold 23 and that this type is to be supplied to the collector or letter case 30. For this purpose the key 4 is depressed so that it arrives into the position shown in dotted lines in Fig. 1. Owing to this movement of the lever 5 the two levers 7 and 8 are rocked around their fulcrum. The piston 11 in the cylinder 12 then first descends so far that it opens the previously closed duct 27 and consequently liquid metal can flow from the pipe 26 or boiler 24 into the cylinder 12. But simultaneously with this movement of the lever 7 the lever 8 is also rocked, so that the two punches 15 and 17 are driven forward. Now since the levers 15 and 17 are connected by their links 14 and 16, respectively, with lever arms of different lengths, it follows that the punch 17, which is on the longer lever arm, moves farther, when the lever 8 rocks, than the punch 15 which is attached to the shorter lever arm. Consequently it follows that the U-shaped portion 22 of the punch 17 is moved farther away from the front end of the punch 15 when the lever 8 moves, and consequently a larger space is formed between the two parts, so that the type located between these parts is entirely liberated and when the punch 15 moves can be ejected from the mold 23. This ejected type then falls by way of the usual channel or slide 29 into the letter case or collector 30. Now the movement of the piston 11 is such with regard to the movement of punch 15 that when the piston releases the duct 27 and consequently enables liquid metal to enter into the cylinder 12, the inlet of the cylinder into the mold 23 is closed by the punch 15. Consequently the metal in the cylinder 12 is kept there at present and prevented from entering into the mold. Only when the type which was previously in the mold 23 has been ejected by the punch 15 and the latter has returned into its normal position as shown in Fig. 1, which is the case when the key 4 is released, is the inlet of the cylinder to the mold released by the punch 15, so that the metal in the cylinder is forced into the mold under the influence of the piston which is lifted again. The duct 27 is simultaneously closed by the piston 11 so that the supply of more metal is impossible. Consequently while a finished type is being ejected from the mold a definite quantity of liquid metal, which is exactly adapted to fill the mold, is stored by the cylinder and this stored quantity is supplied to the mold as soon as the latter obtains its normal shape after the return of the punch 15 to its normal position. The metal brought into the mold 23 is then at once cooled and stiffens, which can either be effected without further ado by making the surfaces of the mold as large as possible, or which can be aided by making the walls 18 and 19 hollow and cooling them with cold water. In any event provision must be made that on the one hand the metal in the duct 26 and cylinder 12 remains fluid under all circumstances, whereas, on the contrary, it stiffens in the mold 23 immediately after it enters and fills the same.

As shown in Fig. 1, the piston 11 is of such dimensions that in its normal position it projects a short distance into the mold 23 so that at this place a hollow or cavity is made in the molded type. The purpose of this is to prevent the formation of a bur or projection which would make it difficult for the type to move in and be removed from the mold. This construction, however, presupposes on the other hand that piston 11 must be drawn back somewhat in order to release the type before punch 15 begins to move for ejecting the type. This is brought about by providing that that end of the lever 7 which is influenced by the key lever 5 extends somewhat lower in its normal position than the free arm of the lever 8, so that when the key lever 5 is depressed, lever 7 and with it the piston are first moved a short distance which just suffices entirely to re-

lease the type located in the mold, whereupon, when the lever 5 is depressed still further, both the levers 7 and 8 are driven and operate as above described.

As will be readily understood from the above, liquid type metal is always kept at hand in this manner and in each mold a finished type is kept, but when this type is ejected the mold is filled afresh with liquid metal and a new type is formed which remains in the mold until, corresponding to the composition in view, it must be ejected by operating the appertaining key. Consequently, in this constructional form it is absolutely unnecessary to have any stock of types or molds or to distribute types after casting the matter. On the contrary, the cast matter is simply put into the boiler 24 again, melted there and used for making new types. Further, it is also evident that the entire manipulation of the machine depends solely on the keys 4 being influenced, and consequently my machine requires no motor for driving it.

A further object of my invention is, however, to provide that also the actual setting of the type be occasioned solely by depressing the keys without the aid of a motor. For this purpose an inclined slide 31 is made which is preferably formed of two approximately A-shaped frames 32. In the slide 31 grooves 33 are provided in which a frame 34 having corresponding ribs or shoulders can slide. The frame 34 can be opened toward the casting device, and is provided in front with a bridge 35 which is integral with or carries a gear rack 36. Within the frame 34 is arranged the real letter case or collector 30 which is movable horizontally by means of suitable grooves in the frame 34 as clearly shown. The frame 34 itself, on the contrary, cannot move horizontally, but slides up and down on the slide 31. As shown in the drawing, both the frame 34 and the case 30 are placed slantwise in such manner that the types ejected from the mold 23 and descending through the known slides or channels 29 arrive directly into the case 30 and are here piled up in rows. Now this letter case 30 with the frame 34 is either placed by hand or by means of a special key in its highest position at the beginning of a new line, so that the bottom of the case where the first types rest is placed, say, just below the bottom edge of the channel 29. In proportion as the additional types arrive in the case 30, however, it and its frame 34 must descend more and more until it arrives into its bottom position in which the line is ended. In order to move the letter case or collector 30 and its frame 34 in this manner, the rack 36 meshes with a toothed wheel 37 journaled in a pedestal 38. Laterally of the toothed wheel 37 and integral with or fixed to it is a ratchet wheel 39, in whose teeth a pawl 40 engages which is attached to a second toothed wheel 41 under the influence of an escapement 42. This escapement is formed like those in clockwork and is on one end of a lever 43 mounted to rock around the pivot 44. The lever 43 which is constantly pulled upward by a spring 45 carried by the base plate 52 engages with its free end loosely under a frame 46 which is mounted to rock like a lever around the pivot 47. The front rod 48 of this frame 46 serves as point of application for the different key levers 5; namely, an arm 49 extends pivotally from each rear end of these levers 5 and engages with a U-shaped portion 50 under this rod 48.

Now when a key 4 is depressed its lever 5 lifts the rod 49, which is guided in an incision 51 in the base plate 52, so that when a rod 49 is lifted the rod 48 is carried with it and the frame 46 is rocked around its pivot 47. Consequently the rear end of this frame-like lever 46 descends and depresses the lever 43 against the action of the spring 45. Owing to this movement the escapement 42 is operated in the customary manner and allows the toothed wheel 41 to rotate one tooth. It is to be observed that the rack 36 meshes with the toothed wheel 37 and consequently the weight of the frame 34 carrying the letter case 30 and its types tends to rotate the toothed wheel 37 and the escapement wheel 41. This rotation is only possible intermittently, owing to the escapement 42, according as the individual keys are depressed, so that in proportion as the types pass down the slides or channels 29 into the letter case the latter falls a step at a time until it arrives at the bottom and the line is finished. The letter case together with its frame 34 may be raised by hand or by a special key, the toothed wheel 37 being able to rotate freely in consequence of the interpolation of the above mentioned ratchet wheel 39 and pawl 40. When a line of superposed types is formed in the case in this manner it is preferable to place the same straight. For this purpose a transverse plate 53 extending into the case 30 is arranged on the bridge 35, and this plate in combination with the one wall of this letter case or a line of type already set forms a compartment 54 into which the types fall. When the completed line is to be straightened the letter case is moved somewhat so that the types of the last line abut against the plate 53 and are thereby placed in a straight row. Then the letter case must be moved so far that a new compartment 54 is formed for forming a new line. The letter case can be moved in this manner either by hand or by means of a special key. Further, it may be preferable, as soon as the line is finished and placed straight, to clamp the types of each line in the letter case or col-

lector in order to make it impossible for the types to move out of place. For this, either suitable wedges may be used which are inserted between the end wall of the letter case and the last type of each line, or screws 55 may be employed which, when turned by hand or otherwise, enter into the letter case and abut against the last type of each line and consequently clamp the entire line. If thumb-screws 55 or the like are employed it is necessary to subdivide the top wall 56 of the frame 34 and to connect the detached strip 57 thus formed by stirrups 58 with the wall 56.

I claim:

1. In a hand-driven type casting and setting machine of the character described, the combination, with a mold and a pump for supplying metal thereto, of a mold punch having a matrix movable in and limiting the size of the mold, a bent lever articularly connected with said mold punch, a key lever for operating said bent lever, and a lever operated by said key lever for actuating the piston of said pump.

2. In a hand-driven type casting and setting machine of the character described, the combination, with a mold and a pump for supplying metal thereto, of a mold punch having a matrix movable in and limiting the size of the mold, a bent lever articularly connected with said mold punch, a closure punch movable in and limiting the size of the mold opposite said mold punch and connected articularly with said bent lever at a point farther from the fulcrum of the same than its point of connection with the mold punch, a key lever for operating said bent lever, and a lever operated by said key lever for actuating the piston of said pump.

3. In a solely hand-operated type casting and setting machine, the combination of a mold comprising a mold punch and a closure punch movable therein, a type metal supply pipe, a cylinder opening into said mold and connected by a duct with said pipe, a piston movable in the cylinder and adapted to close and open said duct, a bent lever having one arm articularly connected with said punches, the point of connection of the closure punch with the same being farther removed from the fulcrum of the lever than the point of connection with the mold punch, a lever pivotally connected with said piston, and a key lever adapted to drive said levers, the arrangement being such that when the piston opens the ducts the cylinder is closed from the mold by the mold punch.

4. In a hand-operated type casting and setting machine, the combination of a mold comprising a mold punch and a closure punch movable therein, a type metal supply pipe, a cylinder opening into said mold and connected by a duct with said pipe, a piston movable in the cylinder, adapted to enter partially into the mold, and adapted to close and open said duct, a bent lever having one arm articularly connected with said punches, the point of connection of the closure punch with the same being farther removed from the fulcrum of the lever than the point of connection with the mold punch, a lever pivotally connected with said piston, and a key lever adapted to drive first the latter lever and subsequently simultaneously said bent lever.

5. In a type casting and setting machine of the character described, the combination, with the key lever operated type casting mechanism, of a vertical or inclined support, a frame slidable vertically on said support, a letter-case movable horizontally in said frame, a gear rack fixed to said frame, pawl and ratchet mechanism meshing with said rack and normally holding said frame above its lowest position, and means connected with the key levers of the casting mechanism for actuating said pawl and ratchet mechanism.

6. In a type casting and setting machine of the character described, the combination, with the key lever operated type casting mechanism, of a vertical or inclined support, a frame slidable vertically on said support, a letter case movable horizontally in said frame, a gear rack fixed to said frame, pawl and ratchet escapement mechanism meshing with said rack and normally holding said frame above its lowest position, a spring-pulled lever carrying the escapement of said mechanism, a pivoted frame resting on the latter lever, and draw rods engaging said frame and pivotally connected with the key levers of the casting mechanism.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

THADDÄUS DROPIOWSKI.

Witnesses:
ROBERT W. HEINGARTNER,
AUGUST FUGGER.